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FLORISTICS OF XERIC SANDHILLS IN EAST TEXAS

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ABSTRACT

The floristics and edaphic conditions of two east Texas xeric sandhills are described. This community occurs in central and northwestern Louisiana, east Texas, and southern Arkansas. The sandy soil is nutrient poor and porous. Water and air move rapidly through it causing rapid drying. In presettlement times, sandhills were probably fairly common in the West Gulf Coastal Plain, but because of fire suppression, grazing, agriculture, oil exploration, and agroforestry, this community has been badly damaged and greatly reduced in extent.

KEY WORDS: Sandhills, xeric, floristics, Sabine National Forest, Texas

INTRODUCTION

Like so many plant communities of the West Gulf Coastal Plain, there is little published information on xeric sandhills (synonyms: sandylands, oak-farkleberry sandylands, xeric sandy woodlands, bluejack oak-pine series) (see Diamond *et al.* 1987; Harcombe *et al.* 1993; MacRoberts & MacRoberts 1994, 1995 for previous literature). This community is listed as endangered by both the U.S.D.A. Forest Service and the Texas Organization for Endangered Species because it is potentially vulnerable to extirpation or severe degradation. Most sandhill communities have been destroyed in northwestern Louisiana (MacRoberts & MacRoberts 1995) and the community is imperiled in the state (Teague & Wendt 1994; Louisiana Natural Heritage Program 1988).

Xeric sandhills of the West Gulf Coastal Plain appear to be similar to turkey oak sandhill forests in the East Gulf Coastal Plain except for the absence of several key species such as turkey oak (*Quercus laevis* Walt.) and wiregrass (*Aristida stricta* Michx.) and the presence of several western elements not found in the east (Stout & Marion 1993).

Sandhills occur mainly in Tertiary marine deposits on ridge tops and upper slopes, and on Pleistocene deposits on terraces near streams. The deep sandy soils are of low fertility and, because of their porous nature, water and air move rapidly through them causing rapid drying. Overstory, midstory, and herbaceous vegetation is often sparse, allowing sun to reach the ground, and in some areas, there are no trees. Reflected glare from the sand is often intense. Trees, typically a combination of overstory pines and midstory oaks, are often stunted. Lichens and mosses are usually plentiful on the bare soils, and the soils, where undisturbed, are often cryptogamic.

In order to learn more about this community, we made a study of the vascular flora of two xeric sandhills in San Augustine County on the Sabine National Forest. We had previously studied xeric sandhills in Caddo and Natchitoches parishes, Louisiana (MacRoberts & MacRoberts 1994, 1995) and in this paper we will have occasion to compare the two Texas sites to those.

METHODS

We visited the two sandhills --- San Augustine and FM 1279 ---every two to three weeks between the autumn of 1994 and the autumn of 1995. The two sites are located about 8 km north of San Augustine near the northern border of San Augustine County. Both are on the Sabine National Forest. They are only about 200 meters apart but are on separate drainages.

Both study areas are partly open (10% - 50% cover); dominant trees are *Quercus incana* Bartr., *Q. stellata* Wang., *Pinus palustris* P. Mill., and *P. echinata* P. Mill. Trees are often stunted and openings occur among wooded areas. San Augustine sandhill covers about 4 ha and FM 1279 is about 1 ha. Although the terrain is hilly and thus topographically variable, both sites are about 200 meters above sea level. They occur on a narrow strip of the Carrizo formation, which becomes more extensive to the northwest (Barnes 1967).

The study sites were selected because they appeared to be of high natural quality. Previous work in the area consists of a brief survey designed to locate high quality examples of communities occurring on the National Forests and Grasslands in Texas (Orzell 1990).

We collected and recorded all vascular plants found. We follow Kartesz (1994) in most instances of botanical nomenclature. Voucher specimens of many of the species collected are distributed among ASTC, BRCH, and VDB.

Soil samples were taken from the upper 15 cm of each sandhill and were analyzed by A & L Laboratories, Memphis, Tennessee.

While the specific fire history of these areas is not known, both sites have been regularly burned by the U.S. Forest Service. Half of San Augustine sandhill was prescription burned on June 14, 1995.

Annual precipitation averages about 100 cm and is fairly evenly distributed throughout the year. Humidity is typically high. In summer, temperatures rise to 35° C, which, when combined with short droughts, translates into very hot and dry conditions. Especially under these conditions, the exposed sands become very dry, and reflected light is intense.

RESULTS

The vascular plants found at San Augustine sandhill [S] and FM 1279 sandhill [F] are listed in Table 1. If the species occurs at both sites, no site location is given.

We list the soil characteristics of the Texas sandhills in Table 2

The soil on which this community occurs is acidic loamy fine sand of low fertility and rapid permeability and belongs to the same soil series described previously for Natchitoches and Caddo Parish sandhills (MacRoberts & MacRoberts 1994, 1995). The soils are often cryptogamous, with a brittle lichenous crust.

DISCUSSION

We recorded a total of 117 taxa, representing 96 genera and 46 families, for the two sites. San Augustine sandhill had 108 species, and FM 1279 had 102. Sorensen's Index of Similarity (IS) between the two sandhills was 88.6, meaning that they are the same community. Seven of the species (*Cyperus grayioides, Eriogonum longifolium, Paronychia drummondii, Polygonella polygama, Pediomelum hypogaeum, Selaginella arenicola* subsp. *riddellii*, and *Tetragonotheca ludoviciana*) are on the Texas National Forests and Grasslands rare species list. Asteraceae, Fabaceae, and Poaceae are dominant families, accounting for about 36% of species.

In 1993 and 1994, we studied a small xeric sandhill in Natchitoches Parish, Louisiana (MacRoberts & MacRoberts 1994) for which we recorded 61 taxa. Of these, 54 (89%) occur in the San Augustine and FM 1279 sandhills. We did not compute an IS between this site and those in Texas since species numbers and size are not comparable, but clearly the three sites belong to the same community.

In 1994 and 1995, we studied three sandhills in Caddo Parish, Louisiana (MacRoberts & MacRoberts 1995). Since the North Louisiana sites are comparable in size and species numbers to the Texas sites, we calculated an IS between them: it is 66, indicating that, although there are some major differences, the sandhills in Caddo Parish and East Texas can be considered the same community.

Table 1. Vascular plants at two xeric sandhills in San Augustine County.

ACANTHACEAE -- *Ruellia humilis* Nutt. [S].
AGAVACEAE -- *Yucca louisianensis* Trel. [F].
AMARANTHACEAE -- *Froelichia floridana* (Nutt.) Moq.
ANACARDIACEAE -- *Rhus aromatica* Ait., *R. copallina* L., *Toxicodendron radicans* (L.) O. Ktze.
ANNONACEAE -- *Asimina parviflora* (Michx.) Duval.
APIACEAE -- *Spermolepis echinata* (DC.) Heller [S].
AQUIFOLIACEAE -- *Ilex vomitoria* Ait.
ARISTOLOCHIACEAE -- *Aristolochia reticulata* Jacq.
ASCLEPIADACEAE -- *Asclepias tuberosa* L., *Matelea cynanchoides* (Engelm.) Wood.
ASTERACEAE -- *Ambrosia artemisiifolia* L. [F], *Croptilon divaricatum* (Nutt.) Raf., *Gnaphalium obtusifolium* L., *G. purpureum* L., *Helianthus debilis* Nutt. subsp. *cucumerfolius* (Torrey & A. Gray) Heiser [S], *Heterotheca pilosa* (Nutt.) Shinners, *Hieracium gronovii* L., *Hymenopappus artemisiaefolius* DC., *Liatris elegans* (Walt.) Michx., *Krigia virginica* (L.) Willd., *Pityopsis graminifolia* (Michx.) Nutt., *Solidago nitida* Torrey & A. Gray, *S. odora* Ait. [S], *Tetragonotheca ludoviciana* (Torrey & A. Gray) A. Gray [F], *Thelesperma filifolium* (Hook.) A. Gray [S], *Vernonia* sp. [F], *V. texana* (A. Gray) Small.
BORAGINACEAE -- *Lithospermum caroliniense* (J.F. Gmel.) MacM.
CACTACEAE -- *Opuntia humifusa* (Raf.) Raf.
CAMPANULACEAE -- *Triodanis perfoliata* (L.) Nieuwl. [S].
CAPPARIDACEAE -- *Polanisia erosa* (Nutt.) Iltis [F].
CARYOPHYLLACEAE -- *Paronychia drummondii* Torrey & A. Gray.
CISTACEAE -- *Helianthemum georgianum* Chapm., *Lechea mucronata* Raf.
CLUSIACEAE -- *Hypericum gentianoides* (L.) B.S.P., *H. hypericoides* (L.) Crantz.
COMMELINACEAE -- *Commelina erecta* L., *Tradescantia reverchonii* Bush.
CONVOLVULACEAE -- *Ipomoea pandurata* (L.) Mey., *Stylisma pickeringii* (Torrey *ex* Curtis) A. Gray.
CUPRESSACEAE -- *Juniperus virginiana* L. [S].
CYPERACEAE -- *Bulbostylis ciliatifolia* (Ell.) Fern., *Cyperus grayioides* Mohlenbrock, *C. retrofractus* (L.) Torr., *C. retroflexus* Buckl., *Rhynchospora grayi* Kunth, *Scleria triglomerata* Michx.
DENNSTAEDTIACEAE -- *Pteridium aquilinum* (L.) Kuhn.
ERICACEAE -- *Monotropa uniflora* L., *Vaccinium arboreum* Marsh., *V. stamineum* L.
EUPHORBIACEAE -- *Chamaesyce cordifolia* (Ell.) Small, *Cnidosculus texanus* (Muell.-Arg.) Small, *Crotonopsis linearis* Michx., *Stillingia sylvatica* L. [S], *Tragia urens* L., *T. urticifolia* Michx.
FABACEAE -- *Baptisia nuttalliana* Small, *Centrosema virginianum* (L.) Benth., *Dalea villosa* (Nutt.) Sprengel var. *grisea* (Torrey & A. Gray) Barneby [F], *Desmodium* sp., *Lespedeza* sp., *Pediomelum hypogaeum* (Nutt. *ex* Torrey & A. Gray) Rydb. var. *subulatum* (Bush) J. Grimes, *Rhynchosia latifolia* Nutt. *ex* Torrey & A. Gray, *Stylosanthes biflora* (L.) B.S.P., *Tephrosia virginiana* (L.) Pers.
FAGACEAE -- *Quercus incana* Bartr., *Q. marilandica* Muenchh., *Q. stellata* Wang., *Castanea alnifolia* Nutt. [F].
IRIDACEAE -- *Alophia drummondii* (Graham) R.C. Foster.

Table 1. (cont.).

JUGLANDACEAE -- *Carya* sp.
LAMIACEAE -- *Monarda punctata* L. [S], *Scutellaria cardiophylla* Engelm. & A. Gray, *Trichostema dichotomum* L.
LAURACEAE -- *Sassafras albidum* (Nutt.) Nees.
LILIACEAE -- *Smilax* sp.
LOGANIACEAE -- *Gelsemium sempervirens* (L.) St. Hil.
OLEACEAE -- *Chionanthus virginicus* L. [S].
ONAGRACEAE -- *Oenothera biennis* L. [S].
OXALIDACEAE -- *Oxalis stricta* L.
PINACEAE -- *Pinus echinata* P. Mill., *P. palustris* P. Mill., *P. taeda* L.
POACEAE -- *Andropogon ternarius* Michx., *Andropogon virginicus* L. [S], *Aristida desmantha* Trin. & Rupr., *Aristida lanosa* Ell., *Aristida purpurascens* Poir., *Bouteloua hirsuta* Lag. [S], *Dichanthelium oligosanthes* (Schult.) Gould, *D. villosissimum* (Nash) Freckman, *D. sphaerocarpon* (Ell.) Gould, *Eragrostis spectabilis* (Pursh) Steud., *Gymnopogon ambiguus* (Michx.) B.S.P., *Paspalum* spp., *Schizachyrium scoparium* (Michx.) Nash, *Sorghastrum elliottii* (Mohr) Nash [F], *Sporobolus asper* (Michx.) Kunth var. *macer* (Trin.) Shinners [S], *Sporobolus junceus* (Michx.) Kunth [S].
POLYGALACEAE -- *Polygala polygama* Walt.
POLYGONACEAE -- *Eriogonum longifolium* Nutt., *Polygonella americana* (Fisch. & Mey.) Small, *P. polygama* (Vent.) Engelm. & A. Gray.
RUBIACEAE -- *Diodia teres* Walt.
SAPOTACEAE -- *Bumelia lanuginosa* (Michx.) Pers.
SCROPHULARIACEAE -- *Aureolaria pectinata* (Nutt.) Penn., *Linaria canadensis* (L.) Dum.-Cours.
SELAGINELLACEAE -- *Selaginella arenicola* Underw. subsp. *riddellii* (Van Eselt.) Tryon.
SOLANACEAE -- *Physalis heterophylla* Nees., *P. mollis* Nutt.
VERBENACEAE -- *Glandularia canadensis* (L.) Nutt. [F].
VITACEAE -- *Ampelopsis arborea* (L.) Koehne, *Vitis aestivalis* Michx., *V. rotundifolia* Michx.

Table 2. Soil characteristics of two xeric sandhills in San Augustine County.

		Exchangeable Ions (ppm)				
Sample	pH	P	K	Ca	Mg	OM%
FM 1279	5.7	8	26	70	12	2.0
San Augustine	5.2	7	27	70	11	1.3

Orzell (1990), in his survey of the plant communities of the Texas National Forests and Grasslands, found the San Augustine sandhills to be of high quality. We concur with this assessment. The sandhills we studied in Caddo Parish, Louisiana were decidedly inferior to the Texas sites and contained many exotics, which accounts for the relatively low IS between them and the Texas sites. The San Augustine sandhills compare favorably to some xeric sandhills we have examined in Natchitoches Parish on the Kisatchie National Forest (MacRoberts & MacRoberts 1994). However, neither of the Texas sites is without damage. A tramway, power line right-of-way, an old dump, roads, and plowed firelines mar the San Augustine site; while FM 1279 is free of these disturbances, it is fire suppressed.

The entire area was cut prior to National Forest acquisition in 1936. Part of San Augustine sandhill was planted with longleaf pine in the early 1940's, but this seems to have failed and the same area was replanted in the late 1940's, again with longleaf pine. The rest of the longleaf appears to have seeded in naturally.

During of the course of this study, we briefly surveyed several other xeric sandhills in East Texas, notably in northwest Jasper, southeast Angelina, and southern Sabine counties on the Angelina and Sabine National Forests. These often grade imperceptibly into upland longleaf pine savannah, but many species fidel to xeric sites pinpoint the more xeric extremes. Notably rich in such fidels are the sandhills running across the southern part of the Angelina National Forest. Some of these rank in quality (and thus rarity) with San Augustine and FM 1279 and should be protected.

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